Form ESA-B4. Summary Report for ESA-257-3
Public Report - Final

Company	Gunlocke Company	**ESA Dates**	12/16/08 – 12/18/08
Plant	Wayland, NY	**ESA Type**	Steam
Product	Furniture Manufacturing	**ESA Specialist**	Thomas M. Maheady, P.E.

Brief Narrative Summary Report for the Energy Savings Assessment:

Introduction:
A steam ESA was done at The Gunlocke Company L.L.C. in Wayland, New York from December 16 to 18, 2008. The principal investigator was Thomas Maheady, P.E. The Wayland plant encompasses 750,000 square feet of manufacturing, storage and office space. The principal products produced at Wayland include high-end office furniture, including chairs and case goods. The manufacturing operation includes custom woodworking as well as fabrication, finishing and assembly of solid wood and laminated products. The primary uses of steam are kilns, finishing ovens, bending presses, retorts, veneer presses and especially make-up air heating related to spray hood exhaust.

The boiler plant houses two boilers:

CP Water Tube Boiler; installed 1952; nominal 283 hp (9800 lb/hr); solid-fuel fired (pulverized wood waste and sawdust, can also fire natural gas and No. 2 fuel oil, or gas/solid or oil/solid mix; no O2 trim or economizer.
Fire Tube Boiler; installed 1972; nominal 600 hp (20,700 lb/hr); but has difficulty achieving greater than 400 hp capacity; primarily fires natural gas but can also fire No. 2 oil; no O2 trim or economizer. Both operate at 125 psig/saturated.

Steam is delivered to the plant processes and support systems at 125 psig and 5 psig. The 5 psig steam main serves the chair-making operation, supplying steam to kilns, retorts and space-heaters. The 125 psig steam main runs throughout the plant, to numerous point-of-use pressure-reducing valves, at a variety of outlet pressures. Other than the wet kilns and retorts, condensate is returned via a system of local receiver-pump units, and pumped directly back to the deaerator. There is no central condensate surge tank.

Objective, Focus and Approach of this ESA:
The objective was to train plant staff in use of the DOE software tools, to jointly build an accurate model of the plant steam system using SSAT, and to identify steam system best practices and energy saving opportunities. Over the course of three days, we briefed the plant team on the goals of the "Save Energy Now" program, made sure they were familiar with the DOE software tools, and worked together to evaluate the plant steam systems for current best practices and potential energy-saving opportunities. Plant data was gathered from available records and actual field observations, and an SSAT model was created and refined. Once the plant team was comfortable with the model and the identified

opportunities, these were analyzed, prioritized and summarized in a presentation made to management on the afternoon of the third day.

Summary of Steam System Scoping Tool (SSST) Results

Area	**GC**	**Industry Avg**	**Perfect**
Steam System Profiling	**18**	**56**	**90**
Action: Install steam metering; measure fuel-to-steam cost; benchmark			
Steam System Operating	**115**	**97**	**140**
Action: Steam trap maintenance, minor boiler plant insulation			
Boiler Plant Operating	**35**	**50**	**80**
Action: Boiler efficiency tests; flue gas temp measurement; O2 control; blowdown heat recovery			
Distribution Operating	**30**	**17**	**30**
Action: In good shape			
Overall	**198**	**220**	**340**

198/340=58%

Opportunities	MMBtu Savings	% of Total
Near-Term	0	0
Medium-Term	3,200	22
Long-Term	11,400	78
Total	14,600	

SSAT Opportunities Analysis

1. Increase Boiler Efficiency by Reducing Stack O2: (savings cannot be modeled using SSAT)
    a. The CP Water Tube boiler is not equipped with O2 trim nor a stack economizer, and the induced draft control damper is not functioning. Stack temperature is 620F and O2 is 8.1%. Given the age of this boiler and space constraints in the boiler room, it may not be practical to install a stack economizer, but proper operation of the draft control system and the addition of automatic O2 trim are worth exploring. Reducing O2 to 6% and reducing stack temperature by 150F results in a 5% efficiency increase. Since no cost is assigned to the solid fuel, the justification for this investment lies in the avoided cost of the solid fuel that the plant anticipates buying if their business slows down in 2009, resulting is less scrap wood produced. Therefore, there are no energy savings (and a “1” was entered in the ESAMS input field so it would accept the project), but there are potential operating cost savings.
    b. This 6% increase in average boiler efficiency translates to a significant savings in avoided fuel costs to purchase scrap wood from outside sources. This opportunity involves the installation of new fuel and draft control damper drives, preliminarily estimated to cost $50-100,000.

    c. This is a Near-Term opportunity. The avoided fuel cost is about 10% of overall site utility costs.
2. Install direct natural gas-fired makeup air units adjacent to the North and South steam makeup air units (cannot be modeled using SSAT)
    a. Although a proposal to install new natural gas-fired equipment sounds counterintuitive, the existing situation at Gunlocke creates a unique opportunity. The steam makeup air units represent at least one third of the boiler load. The gas boiler is brought on-line in cold weather in response to a drop in header pressure. If the makeup air unit load is reduced, the gas boiler will need to run less, or perhaps not at all. The gas load being eliminated is at 83% efficiency; the gas load being added is at 100% efficiency (direct firing.) The gas boiler will be capable of carrying the full plant steam load if the makeup air is heated with gas.
    b. This strategy results in a significant potential annual savings in natural gas. The installation cost for the new makeup air units is estimated to be $200-225,000. This can be undertaken in phases. This will reduce the initial capital investment, and allow for some experimentation, possibly to a determination that one gas-fired makeup air unit is sufficient to execute this strategy.
    c. This is a Medium-Term opportunity. The cost savings is about 1.4% of overall site utility costs.
3. Install New Solid Fuel Boiler(s) (cannot be modeled using SSAT)
    a. Plant personnel have already explored a project to install one or more new solid fuel-fired boilers, with sufficient capacity to eliminate the need to fire the fire tube gas boiler, and also to pick up most of the present gas-fired makeup air load. There will be savings associated with the conversion of this gas-fired load to the steam system, but no new cost will show up in the SSAT model because no cost is assigned to the waste wood solid fuel. Beyond cost, there is an issue with the reliability of the solid fuel supply. There is presently a very close balance between the quantity of scrap that the plant produces at its present operating level, and the amount of waste wood fuel that is required to satisfy the present steam load, roughly 27.5 Tons each. If one or more new boilers are installed, and the present gas-fired load is added to the steam system, the plant may need to buy waste wood from an outside source.
    b. Via a series of off-line calculations to model this scenario, we determined that this project will result in a significant annual savings. Based on fairly detailed numbers assembled by plant personnel just three months ago, the cost of this project is estimated to be $2,000,000 to $2,500,000.
    c. This is a Long-Term opportunity. There is no new fuel savings; natural gas use is reduced, but waste wood use increases.
4. Install New Solid Fuel Boiler(s) with Cogeneration (cannot be modeled using SSAT)
    a. Plant personnel have already explored a project to install one or more new solid fuel-fired boilers, with sufficient capacity to eliminate the need to fire the fire tube gas boiler, and also to pick up most of the present gas-fired makeup air load and to co-generate up to 15% of peak site demand (limited by NY state utility regulation.) These boilers would operate at 450 psig with 100F of superheat, supplying a turbine with its backpressure set at the 125 psig plant operating pressure. The actual turbine generator output that matches the average steam demand is 188 KW. The off-line calculations for this scenario are similar to the previous opportunity, adding the cost of the additional fuel required to

generate superheated steam at the higher pressure (estimated to be an additional 47 Tons of purchased wood waste), and subtracting the cost of the co-generated electricity = a significant potential savings.

   b. This project results in a significant annual cost savings. The cost estimate prepared by plant personnel for this project three months ago pegged it at $3,000,000 to 3,500,000.
   c. This is a Long-Term Opportunity. Solid fuel use will increase, and natural gas use will be reduced.

5. Reduce Exhaust Air Volume and Makeup Air Heating (SSATv3 Project 1.1)
   a. The largest steam demand in this facility is makeup air heating related to the considerable quantity of exhaust for spray booths. There is general consensus among plant personnel that it may be possible to reduce the overall steam load by perhaps 10% through a series of projects related to the introduction of new finishing technologies that reduce the need for open spraying. There are many operational considerations that need to be satisfied to achieve this goal, but there is confidence it can be done over time.
   b. Modeling this as a "Steam Demand Savings" translates to a significant potential fuel and makeup water savings. The estimated investment to achieve this is $1,000,000 to $2,000,000.
   c. This is a Long-Term Opportunity. Fuel savings is about 8% of overall site utility cost.